

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
20 January 2005 (20.01.2005)

PCT

(10) International Publication Number  
**WO 2005/006020 A1**

(51) International Patent Classification<sup>7</sup>: **G01V 1/28**

(21) International Application Number:  
PCT/GB2004/002614

(22) International Filing Date: 17 June 2004 (17.06.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
0315790.6 5 July 2003 (05.07.2003) GB

(71) Applicant (for all designated States except CA, FR, US):  
**WESTERNGECO SEISMIC HOLDINGS LIMITED**;  
Citco Building, P.O. Box 662, Road Town, Tortola, British  
Virgin Islands (VG).

(71) Applicant (for CA only): **WESTERNGECO CANADA  
LIMITED** [CA/CA]; 237 - 4th Avenue S.W., 30th Floor,  
Fifth Avenue Place, Calgary, Alberta T2P 4X7 (CA).

(71) Applicant (for FR only): **SERVICES PETROLIERS  
SCHLUMBERGER** [FR/FR]; 42, rue Saint Dominique,  
F-75007 Paris (FR).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **ARROWSMITH,  
Stephen** [GB/GB]; Easter Insh, Insh, By Kingussie, Inver-  
ness Shire PH21 1NU (GB). **EISNER, Leo** [CZ/GB]; 41  
Verulam Way, Cambridge CB4 2HJ (GB).

(74) Agent: **MIRZA, Akram, Karim**; Intellectual Property  
Law Department, Schlumberger Cambridge Research Lim-  
ited, High Cross, Maddingley Road, Cambridge CB3 0EL  
(GB).

(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AE, AG, AL, AM,  
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,  
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,  
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,  
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,  
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,  
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,  
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,  
ZW.

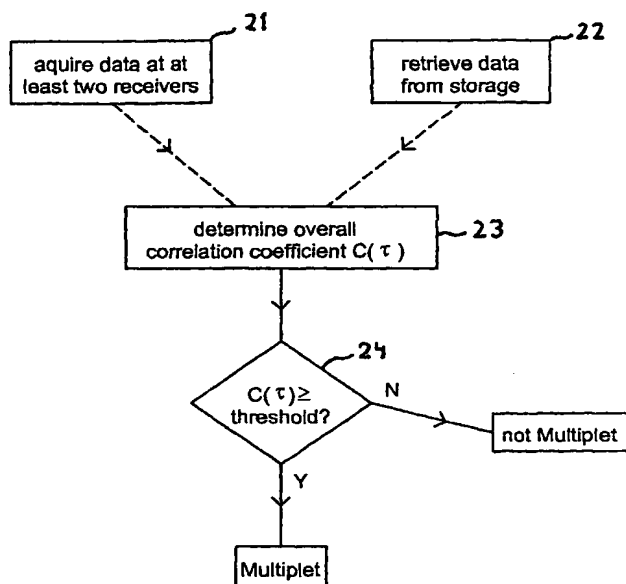
(84) Designated States (unless otherwise indicated, for every  
kind of regional protection available): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,  
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,  
FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI,  
SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
GW, ML, MR, NE, SN, TD, TG).

**Published:**

- with international search report
- before the expiration of the time limit for amending the  
claims and to be republished in the event of receipt of  
amendments

[Continued on next page]

(54) Title: **PASSIVE SEISMIC EVENT DETECTION**



(57) Abstract: A method of identifying passive seismic events in seismic data that contains at least first seismic data traces acquired at a first seismic receiver and second seismic data traces acquired at a second receiver spatially separated from the first receiver comprises determining an overall measure of similarity for a pair of events in the seismic traces. The overall measure of similarity is indicative of similarity between the events acquired at the first seismic receiver and of similarity between the events acquired at the second seismic receiver. In one method, the overall measure of similarity is an overall cross-correlation coefficient. The overall cross-correlation coefficient is found by determining a first correlation coefficient for the pair of events from the data acquired at the first receiver and determining a second correlation coefficient for the pair of events from the data acquired at the second receiver. The overall correlation coefficient for the pair of events may be obtained from the first correlation coefficient and the second correlation coefficient by an averaging process. The overall measure of similarity may be compared with a threshold to determine whether the pair of events form a doublet. The method makes possible real-time or near-real-time identification of doublets.

WO 2005/006020 A1



---

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*